A.D. 1854 . . . . N° 371.

Apparatus for Transmitting Electric Telegraph Signals.

LETTERS PATENT to Cromwell Fleetwood Varley, of No. 1, Charles Street, Somers Town, St. Pancras, Middlesex, for the Invention of "A NEW ARRANGEMENT OR APPARATUS FOR TRANSMITTING ELECTRIC TELEGRAPH SIGNALS."

Sealed the 12th August 1854, and dated the 16th February 1854.

PROVISIONAL SPECIFICATION left by the said Cromwell Fleetwood Varley at the Office of the Commissioners of Patents, with his Petition, on the 16th February 1854.

I, CROMWELL FLEETWOOD VARLEY, of No. 1, Charles Street, Somers Town, Saint Pancrass, Middlesex, do hereby declare the nature of the said Invention for "A NEW ARRANGEMENT OR APPARATUS FOR TRANSMITTING ELECTRIC TELEGRAPH SIGNALS" to be as follows:—

My Invention consists of three parts, dependent on & necessary to each other. One part is call'd a key, to transmit the signals along the line wire. Another part is a pecker, to govern a local circuit, either to print or otherwise render those signals inteligible. The third is a switch, placed on the same board as the key. It is used to connect the line wire to the key when sending & to the pecker when receiving a communication; the key has a handle kept up (as usual) by a spring, which being successively depressed & allowed to rise, produces the required signals. This handle when at rest causes an electric current to flow along the line wire, but while being depressed, it first intercepts & immediately afterwards reverses the current. These currents, after traversing the line wire, enters the pecker, to actuate by its means a local battery circuit. The pecker consists mainly of a permanent magnet, so mounted that gravity causes an arm on its axle to rest against a spring stop, completing the local circuit; this circuit is kept broken by the current which enters the pecker from the line wire when the key is at rest.

To make a signal, the key handle is depressed, the line current as aforesaid is first stopped and then reversed, acting with gravity in the pecker to complete the local circuit.

The use of a current in conjunction with gravity or any similar acting power to complete a local circuit & an opposite one to break it, renders the action of the local battery both rapid and certain. My Invention is therefore well adapted for transmitting signals thro' extended metalic conductors.

The switch, while in the act of turning the line wire from key to pecker, & vici versa, connects the wire to the earth, thereby discharging any residual electricity. The key does the same at the intervals between the change of currents. In circuit with the pecker is placed a common indicator needle, to call attention. My pecker arrangements may be used for relay currents for very extended or branch lines.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Cromwell Fleetwood Varley in the Great Seal Patent Office on the 14th August 1854.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, Cromwell Fleetwood Varley, of No. 1, Charles Street, Somers Town, St. Pancras, Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Sixteenth day of Febuary, in the year of our Lord One thousand eight hundred and fifty-four, in the seventeenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Cromwell Fleetwood Varley, Her special licence that I, the said Cromwell Fleetwood Varley, my executors, administrators, and assigns, or such others as I, the said Cromwell Fleetwood Varley, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "A NEW ARRANGEMENT OR APPARATUS FOR TRANSMITTING ELECTRIC TELEGRAPH SIGNALS," upon the condition (amongst others) that I, the said Cromwell Fleetwood Varley, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Cromwell Fleetwood Varley, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The retardation of & fluctuation of power in electric currents by induction, when traversing submarine or subterranean wires of great length, which unfits them for ordinary printing telegraphs, are obviated by my contrivance which latter enables me to work to much greater distances & with less power than heretofore.

My Invention consists of three parts, dependent on & necessary to each other. One part is call'd a key, Figs 1 & 2, to transmit the signals along the line wire, to which it is connected by the terminal L. Another part Figs 3 & 4 is a a pecker (or relay) to govern a local circuit, either to print or otherwise render those signals intelligible. This & the key are connected by wire from their mutual terminals P, P. The third part is a switch, 5 & 6, placed on the key-board, Figs 1 & 2; its handle has two positions marked *send & receive*, it being used to connect the line wire to the key when sending, & to the pecker when receiving a communication, both ends of the line being furnished alike with a key, pecker, & switch.

The key handle *a* is kept up by springs *b* & *c* (in electric union with the terminals C, Z); this being successively depressed & allowed to rise, produces the required signals. Whilst the handle is up, it allows an electric current to flow along the line wire to another station; but on being depressed, it at half way connects the line wire direct to the earth & discharges it; when down to the stop 26, it reverses the current. These currents after traversing the line wire circulate thro' the distant pecker to actuate by its means a local battery circuit. The pecker consists mainly of a galvanometer magnet; it has one end heaviest, Figs 10 & 11, & so mounted that gravity causes an arm or contact piece *d*, on its axis to rest against a spring stop *e*, Fig. 7, thereby completing the local circuit, but the current from the line wire which is passing thro' the pecker whilst the distant key is at rest, keeps this circuit broken by deflecting the arm *d* from the spring *e*, as shown in Fig. 7.

PASSAGE OF THE CURRENTS THRO THE APPARATUS.

The key handle *a* is fixed to an axis C, Z, made in two parts, which are insulated from each other, & also united by an ivory center piece as shewn in section, Fig. 8. These are by their springs *b* & *c* always in connection with the ends C & Z of the battery. The ivory central disc is surrounded by two half circles of metal, which do not touch each other; one half is united to the handle *a* & end Z, the other half to the end C. The handle being up in Fig. 2, the zinc current flows thro' it into the spring *f*, thence underboard to a spring *g*, on which the switch pin *h* is pressing; this receives & leads it underboard to the terminal L, & thence along the line wire to the distant station, where it enters their key board at the terminal L, Fig. 1, & thence underboard to the switch 5, which is turned to *receive;* it passes thro' the pin & spring *i*, *j*, to the terminal P, thence to the pecker, entering at P, Fig. 3, where, by traversing the coils of the magnet, it deflects it so as to remove the contact arm *d* from *e*, & breaks their local circuit, as before stated.

The passage from P is up the coated wire *p*, thro' *q*, & the coils of the common indicator *r*, down the wire *s*, *s*, up the spiral *t*, thro the coils *u*, *u*, enclosing the magnet, which it deflects according to the current right or left, & out thro' the spiral *v*, & terminals *v*', E, to the earth. Oft as the distant correspondent depresses his key, so often is the current reversed; then deflection that way is assisted by gravity to make sure & instant contact with the parts *d* & *e*; deflection the other way overcomes gravity & again separates them.

To make a signal, place the switch as at 6, the key handle is to be depressed, as Fig. 1; this, while passing midway down, removes the end of the curve Z from the knob *l*, & brings the end of the opposite half C just under, & for that moment connects it & the line wire direct to the earth thro' the under or earth spring *k* (both springs bearing for a moment on the same semicircle), & relieves it of its induced charge. The next moment the under end *m*, of the half circle Z passes on to the earth spring *k*, & the current is reversed. The halves C & Z having mutually changed springs, & thus stopping current & joining line wire to earth, occurs at the middle of every rise & fall of the key handle, or between every change of current. The curve C being a little more than half, gives space for the two springs bearing momentarily on it as they are changing halves.

These alternate changes making & breaking contact in the local circuit, enables that circuit to actuate any of the telegraphic apparatus calculated to work by local battery.

There is under the switch a third spring *n*, connected to the earth, & a corresponding switch pin *o*, which momentarily touches it while being turned over from *send* to *receive*, & vice versa, to releive the wire of its charge direct to the earth at every change, & so preserve the magnets from the powerful currents which wou'd otherwise traverse the coils surrounding them.

The circuit of the local battery begins at *e*, Fig^s 7 & 9 (its plate *w* being insulated from the dial by thin horn under it & horn collets under the screw heads), & proceeds along the wire *x*, thro' the ivory hole *y*, & cover'd spiral *z*, to the terminals 1 & 2, Fig. 3, from thence thro' its portion of local circuit, to print or otherwise render signals, according to the apparatus used, & returns to the terminal 3 up the wire 4, to the frame 5, along the magnet axis to the contact arm *d*, which is ready to touch or to be separated from the spring *e*, according as the line current shall determine.

The indicator *r*, a plain galvanometer, is mounted as usual; its dovetail'd bar 6 sliding into a metal groove 7, which is screwed to the back board 8. The dial frame 5, of the pecker magnet is in like manner fitted to a box 9, but this box has an axis 10, fitted into a hole 11, & is moveable by the handle 12. This movement is to turn the dial more or less round as Fig^r 3, & so adjust the force with which gravity shall aid the current to make contact between the parts *d* & *e*. The place of the spring *e* is determined by a pin 13, & the right degree of tension is given by moving the tail 14, & fixing it by the screw 15. The motions of the arm & spring *d*, *e*, are each limited by their adjusting screws 16, 17. Fig. 4 shows two pillars 5, 5, which make up the pecker frame; these are left out in Fig. 9. The cross bar 18, which holds the coils *u*, *u*, is insulated from the frame by thin horn 19 interposed; this bar being the connecting link between the two coils. In Fig^s 3 & 9, an arm 20 supports the magnet axis; in Fig^r 7, a part is broken away, to show the contact arm & spring *d*, *e*. Fig^s 10 & 11, two separate views of the magnet, axis, & contact arm *d*; Fig. 12, one of the coil frames *u* separate; 21, Fig. 4, section of case with glass front; 22, 22, Fig^r 3, its guide pins; 23, a screw to fix it. The dial has divisions, & a fixed index 24 shows how much it is moved. The motion of the key handle *a* is both adjusted & limited by the screw & screw-post 25 & 26.

This arrangement is capable of working with much less power than was heretofore required. Leakage from one wire to the other (known technically as contact) does not interfere with my apparatus, unless it becomes stronger than the working amount received, because the contact piece is held by current either to one side or the other.

CLAIMS.

The arrangement of the key for reversing the currents & discharging the line wire between each alternation.

The arrangement by which the switch at every move releives the line wire of its induced charge, & so protects the magnets from the demagnetising influence of these powerful discharges.

The use of a galvanometer for a pecker, whose local circuit contact is made by rubbing against a spring, thus making very small power sufficient for telegraphic purposes, the deflection for contact being assisted by gravity, the reverse current overcoming gravity & holding back, thus using the *sum* instead of the difference of the acting forces.

The power used to actuate the galvanometer being small, the contact piece *d* is made to strike obliquely against the spring *e*, which yeilding to the touch gives a sliding contact which effectually rubs away the slight cushion of air which wou'd otherwise prevent that immediate sure contact so necessary for rapid communication, & to secure the best action gold is used for these delicate parts of contact, but this I do not claim.

Fig^rs 7, 9, 10, 11, & 12, are full size, the other Fig^r half size.

In witness whereof, I, the said Cromwell Fleetwood Varley, have hereunto set my hand & seal, this 14th day of August, A.D. 1854.

CROMWELL FLEETWOOD VARLEY. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1854.

A.D. 1854, FEBRUARY 16, No. 371. (ONE SHEET.)

VARLEY'S SPECIFICATION.

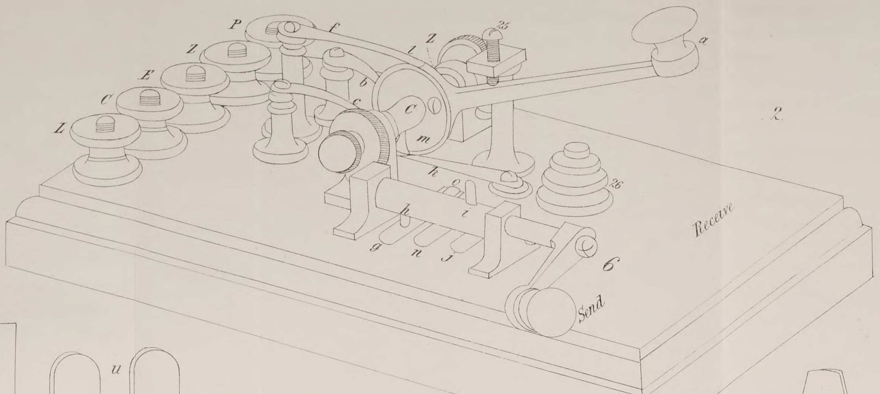

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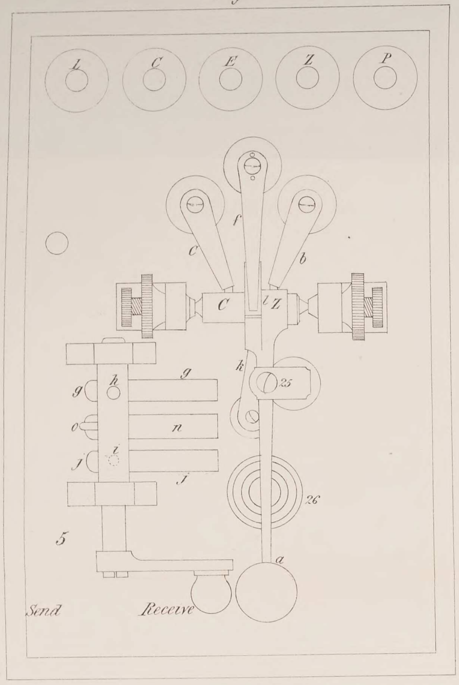
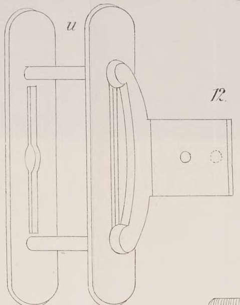
Fig 1





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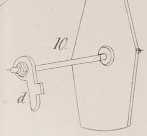

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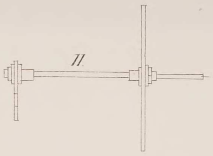

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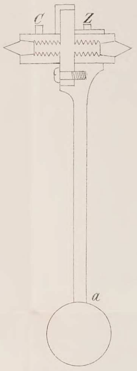

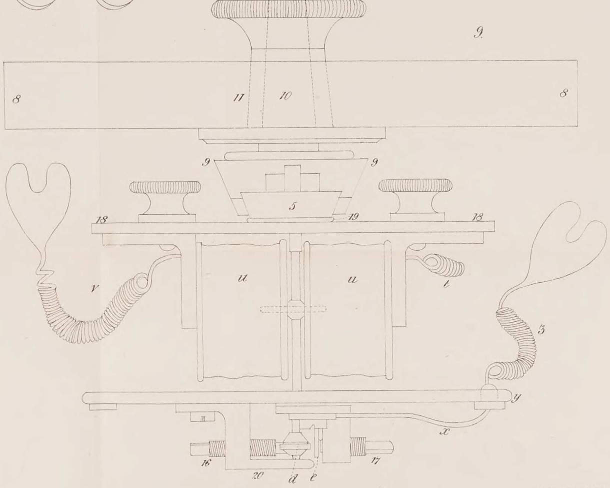

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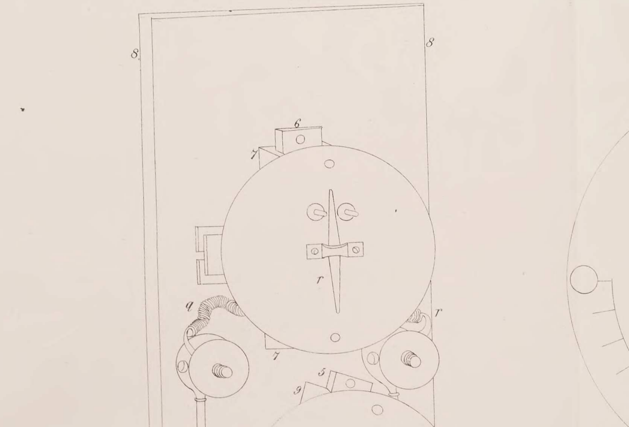

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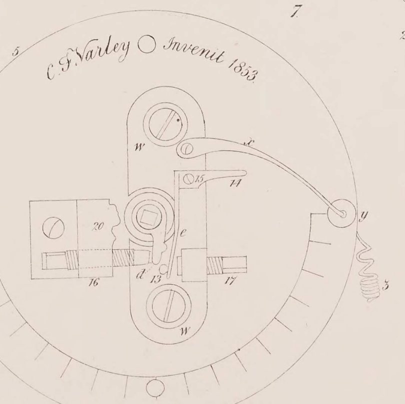

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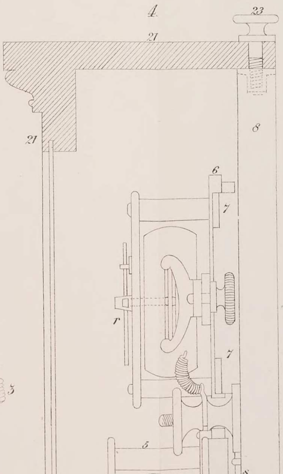

THE FILED DRAWING IS COLORED.

R. PROSSER. LITH.

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Printers to the Queen's most Excellent Majesty. 1854.